

SEMICONDUCTOR DEVICE HAVING REDUCED  
EFFECTIVE SUBSTRATE RESISTIVITY  
AND ASSOCIATED METHODS

Abstract of the Disclosure

A semiconductor device includes at least one device active region formed in a first surface of a semiconductor substrate, an electrical contact layer on a second surface of the semiconductor substrate, and at least one resistivity-lowering body positioned in a corresponding recess in the substrate and connected to the electrical contact layer. The body preferably comprises a material having an electrical resistivity lower than an electrical resistivity of the semiconductor substrate to thereby lower an effective electrical resistivity of the substrate. The device active region may be an active region of a power control device, such as a MOSFET or IGBT, for example. The body may preferably comprise an electrical conductor such as copper, aluminum, silver, solder, or doped polysilicon. The at least one recess and associated resistivity-lowering body preferably defines a proportion of the semiconductor substrate area adjacent the device active region greater than about 0.4 percent, and may extend into the semiconductor substrate a distance greater than about 25 percent of a thickness of the substrate.